

ONTARIO WATER RESOURCES COMMISSION

1970 cottage pollution control program  
Six Mile Lake Distric municipality of  
Muskoka.

1971

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ONTARIO WATER RESOURCES COMMISSION

ONTARIO DEPARTMENT OF HEALTH

SIX MILE LAKE

As a result of recommendations contained in the March, 1970, report on Environmental Management of Recreational Waters in Cottage Areas in Ontario, water quality surveys of Six Mile Lake located in the District Municipality of Muskoka were conducted by staff of the Ontario Water Resources Commission on July 15 and during the period from August 29 to September 1, 1970.

Prior to 1970, staff of the Ontario Department of Health's Public Health Engineering Service had performed investigations of the on-shore private sewage disposal systems in the north section (Crooked Bay - Long Lake area) of Six Mile Lake.

Since the July 15 survey was of a preliminary nature only, this report will deal with the results of the main survey only, namely, from August 29 to September 1.

The water generally met the OWRC bacteriological criteria for total body contact recreational use. The bacteriological results as well as the location of the sampling points are shown on the appended maps. It will be noted that, at many stations, a single value was used for each bacteriological indicator organism tested; this was possible since, according

to the statistical evaluation performed by the OWRC's Bacteriology Branch, the bacterial densities at many stations were not significantly different from one another. The only exceptions where the bacterial densities were not within OWRC criteria occurred at Stations 11 and 40 regarding fecal streptococcus organisms; however these higher levels were most likely due to the natural environment at these stations.

Thermal stratification, a natural occurrence in many lakes, was observed at Stations 3A, 27 and 50A (see map). Two thermoclines (zones of rapid temperature change) were observed at Station 3A while only one was definitely detected at Stations 27 and 50A.

The dissolved oxygen in the surface waters was above the level designated by the OWRC for the preservation of biological life. At Station 3A, the dissolved oxygen content decreased below the required level in the upper thermocline and in the bottom 15 feet. At Station 27, the dissolved oxygen content was below the level designated by the OWRC for the preservation of biological life between 22 feet (in the thermocline) and 55 feet below the surface and also in the bottom 15 feet. The oxygen depletion in the thermocline area is attributed to the rapid decomposition of oxidizable materials temporarily accumulated in the thermocline region. The oxygen depletion at the bottom is due to decomposing organic matter

located on the lake bottom. At Station 50A in Crooked Bay, the dissolved oxygen was below the required level from a depth of 20 feet below the surface to the bottom; it appears that more decomposing matter was present there than at the other two stations. It should be noted that further studies beyond the scope of this survey would be required to determine whether the organic matter was induced by artificial or man-made means also rather than natural processes alone.

The concentrations of nutrients (organic nitrogen and phosphorus) were not high and were uniform throughout the lake's surface waters. A lower mineral content was detected at Station 9 in Crooked Bay; this is attributed to this area being geographically separate from the rest of the lake, which is influenced by the more mineralized waters from the Severn River. Nevertheless, the surface waters of Six Mile Lake may be considered moderately hard, having a hardness varying from 64 ppm to 78 ppm. The survey also revealed that rainfall caused small variations in a few chemical parameters.

## BACTERIOLOGICAL INDICATOR ORGANISMS

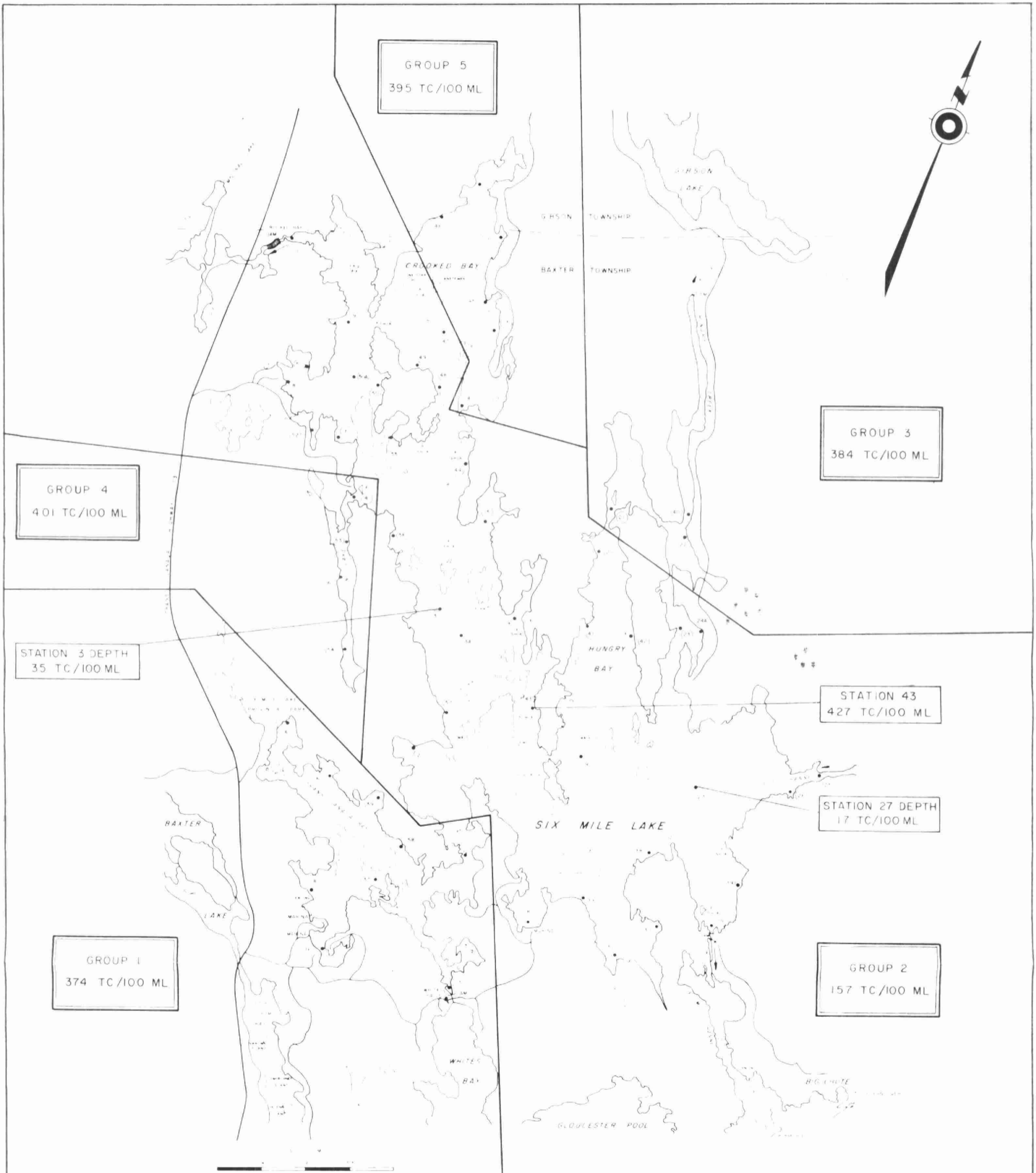
TOTAL COLIFORM organisms include a wide variety of bacteria ranging from the genus (group) Escherichia Coli (E. coli), which originate mainly in the intestines of man and other warm blooded animals, to the genera Citrobacter and Enterobacter aerogenes. The latter genera are basically found in soil but are also present in feces in small numbers. The presence of total coliforms in water may indicate soil run-off or, more important, less recent fecal pollution since organisms of the Enterobacter - Citrobacter groups tend to survive longer in water than do members of the Escherichia Coli group, and even to multiply when suitable environmental conditions exist.

The FECAL COLIFORM organisms are those coliform bacteria which are of intestinal origin and, therefore, are an indicator of recent fecal pollution. Most of the coliform bacteria found by the fecal coliform test are of the genus Escherichia Coli.

FECAL STREPTOCOCCI organisms are normal inhabitants of the large intestine of man and animals and generally do not multiply outside the human body. In waters polluted with fecal material, fecal streptococci are usually found along with fecal coliform bacteria but in smaller numbers. When the number of fecal streptococci bacteria approximates or is greater than the number of fecal coliform organisms, animals are the probable source.

The OWRC Guidelines and Criteria for Water Quality Management in Ontario (1970) indicate that water used for total body contact recreation can be considered impaired when the total coliform, fecal coliform, and/or fecal streptococcus geometric mean density exceeds 1000,100, and/or 20 per 100 ml, respectively.

NOTE: The term "geometric mean" refers to a type of average. Mathematically speaking, the geometric mean of a set of N numbers is the Nth root of the product of the numbers; in practice, it is computed by the use of logarithms.



AUGUST 29 TO SEPTEMBER 1, 1970 SURVEY

TOTAL COLIFORM (TC) GEOMETRIC MEAN DENSITIES

LAKE IS DIVIDED INTO 5 GEOGRAPHIC AREAS. PROMINENT BLOCKS INDICATE BACTERIAL DENSITIES FOR ALL STATIONS IN RESPECTIVE AREAS. EXCEPTIONS TO AREA DENSITY ARE SHOWN IN SMALLER BLOCK(S) AND REFER TO SPECIFIC STATION(S)

LEGEND (37) ● SAMPLING POINT → FLOW DIRECTION

ONTARIO WATER RESOURCES COMMISSION	
1970 RECREATIONAL LAKES PROGRAM	
SIX MILE LAKE	
SCALE: AS NOTED	
DRAWN BY: AJH	DATE: NOVEMBER 1971
CHECKED BY: R M	DRAWING NO 71-99-DE(A)



AUGUST 29 TO SEPTEMBER 1 1970 SURVEY

OVERALL \* GEOMETRIC MEAN BACTERIAL DENSITIES

5 FECAL COLIFORM (FC)/100 ML

3 FECAL STREPTOCOCCUS (FS)/100 ML

\* EXCEPT WHERE OTHERWISE INDICATED ON THIS MAP IN SUCH EXCEPTIONS, THE DIFFERING BACTERIAL DENSITY IS SHOWN AND THE REMAINING OVERALL DENSITIES APPLY.

LEGEND (25) ● SAMPLING POINT → FLOW DIRECTION

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